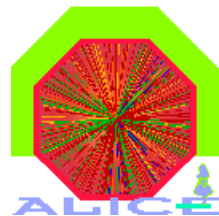


TRD Status

Christoph Blume



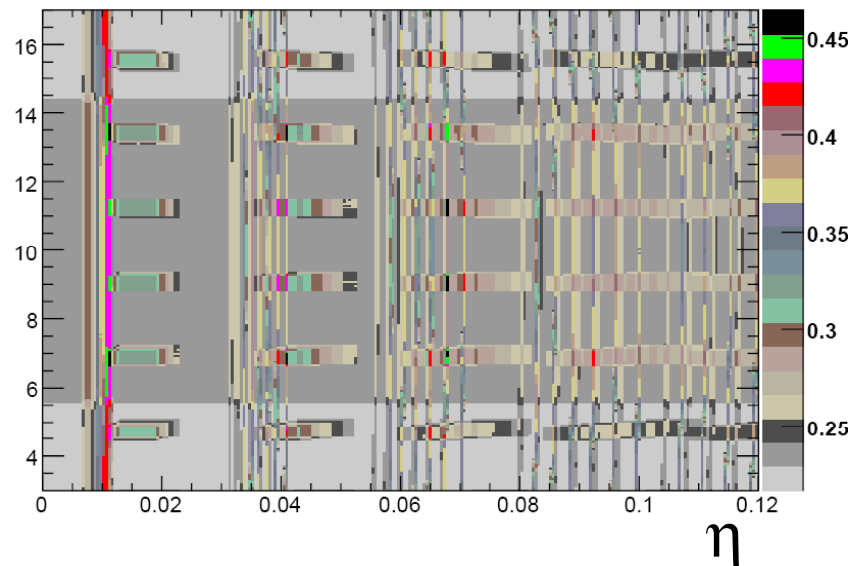
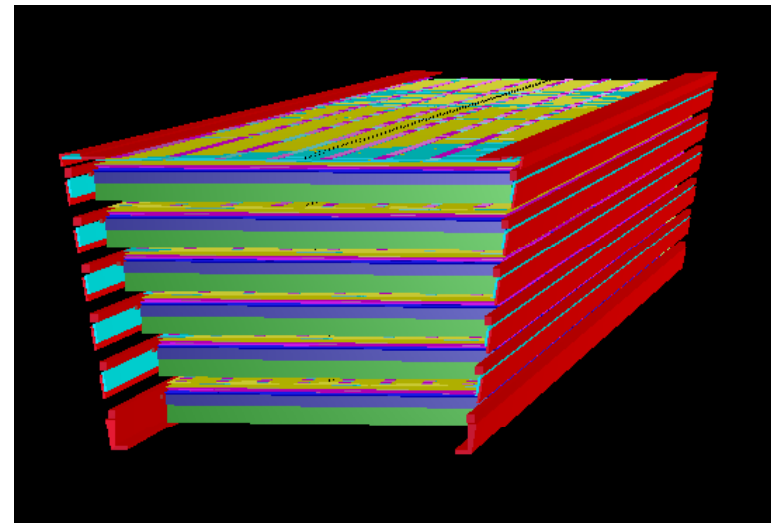
Offline Week, October, 2007

Outline

- Geometry
- Local reconstruction
 - Faster cluster finding algorithm
- Raw data with zero suppression
 - Talk by Ken
- TRD tracking
- Calibration
- Electron PID
 - 2D method
 - NN method
- Alignment
 - Talk by Dariusz

Geometry: Material Budget

- Last Offline week:
 - Corrected material budget in sensitive area of detector
 - Corrected version has $\langle X/X_0 \rangle = 25.7\%$ (averaged over sensitive area)
 - Part of release 4-06
- Pending modifications:
 - Additional mock-up services outside acceptance:
AliRoot: 1541kg
(no services for $|\eta| > 1$)
Reality: ~ 1700kg
 - Carbon inserts in aluminum covers to reduce X/X_0
 - Task date: 31/10/07

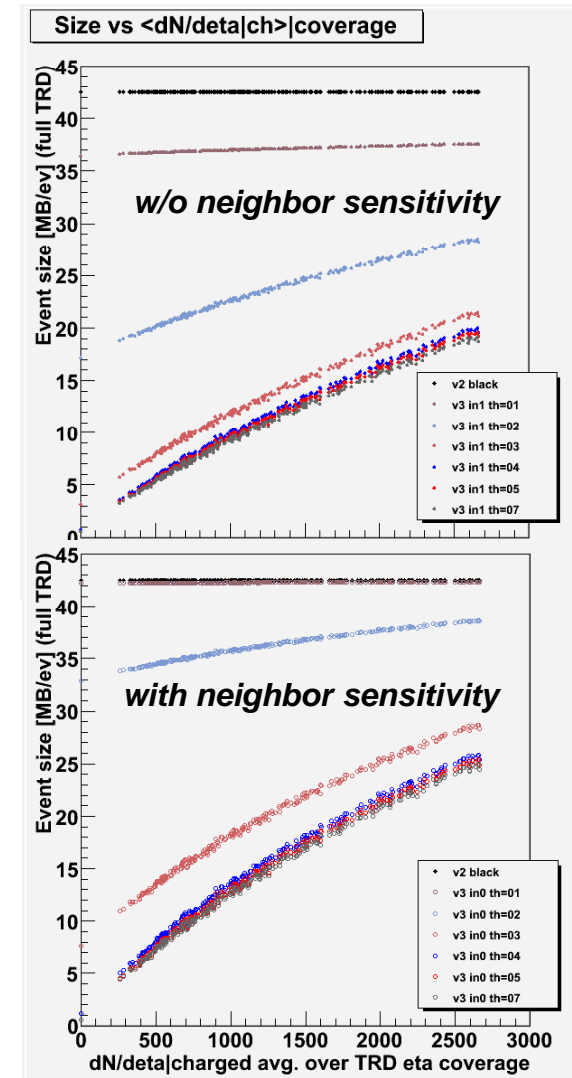


Local Reconstruction

- Faster cluster finding algorithm developed (Mateusz)
 - See also talk in HLT session
 - Faster digits access
 - New class `AliTRDSignalIndex`
 - Revision of `AliTRDRawStream::Next()`
 - Lower memory consumption
 - Data only kept in memory for single chamber and released after processing
 - General speed up: Optimization of loops, database access, etc.
 - Gain in speed by factors 2-4 (w/o ZS!)
- Part of release 4-06

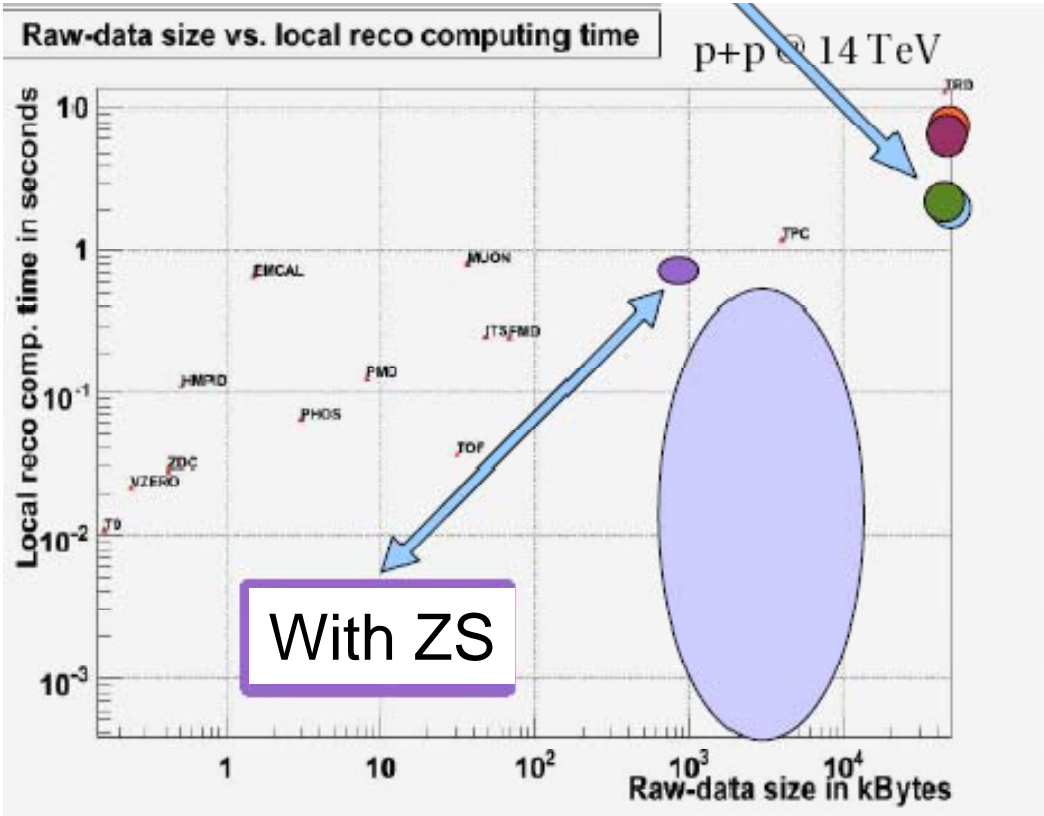
Raw Data with Zero Suppression

- Data format with ZS now available
 - Details: see next talk by Ken
- Part of release 4-06
- Implementation:
 - Reading via `AliTRDRawStreamV2` (Mateusz)
 - Class `AliTRDmcmSim`
 - Digital filters
 - ZS mapping as in TRAP
 - Produces MCM raw stream
 - Class `AliTRDfeeParams`
 - FEE configuration parameters
- Further modifications of details of format and parameters as design evolves



TRD Local Reconstruction Speed

W/O ZS!



Cluster Coordinates and Transformation

- Cluster positions now tracking coordinate system
- Introduction of `AliTRDtransform`:
 - Cluster (row, column, timebin)
→ calibrated space point position (X, Y, Z)
 - Base class `AliTransform` (currently in TPC directory)
 - Called in cluster finder `AliTRDclusterizer`
(no V1 or V2 any more)
 - `AliTRDtracker::Transform()` has been removed
 - Possibility to recalibrate already reconstructed cluster any time
(new data member in `AliTRDcluster` for padrow and timebin)
- Implementation now in HEAD

TRD Tracking

- (Re-)implementation of TRD tracking using tracklets
 - Development by Marian a while ago
 - Swept under the rug after move to new tracking framework
- TRD cluster information highly correlated
 - Estimation of error on space point position difficult
 - Replace clusters in one chamber by a tracklet
 - Tracklet finding part of `AliTRDtracker::FindClusters()`
- Kalman filter update using tracklet information
 - `AliTRDtrack::Update(AliTRDtracklet &t)`
- Problem:
 - Tracklet information has to be present for `RefitInward`
 - Suggestion to keep tracklets in `AliESDfriends` (instead of clusters?)
- Task date: 31/10/07
 - Important issue: QA

Calibration

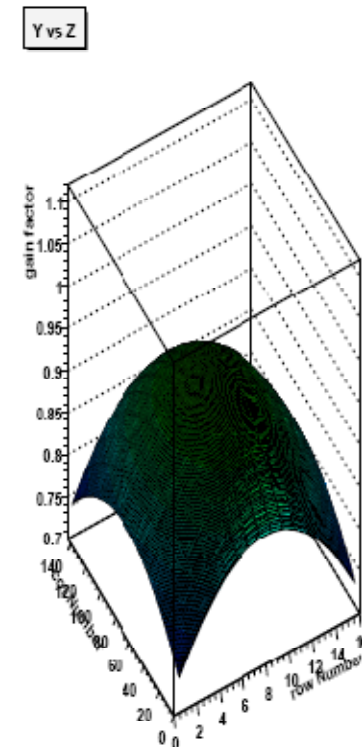
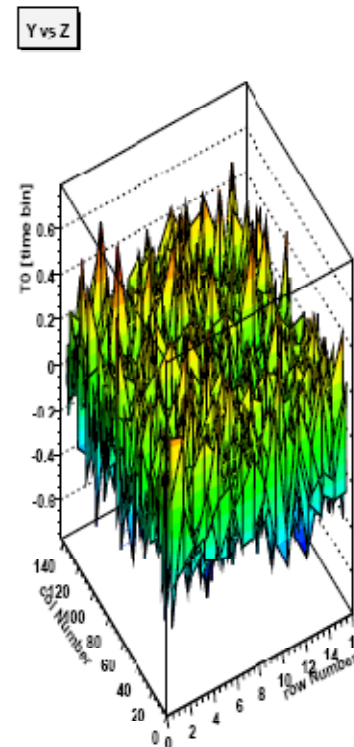
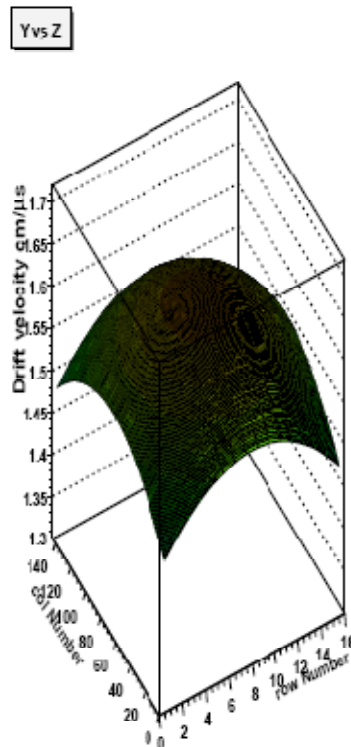
- Offline+HLT (Raphaelle):
 - Detector algorithms in CVS since a while
 - Uses clusterizer and stand alone TRD tracking
 - Gain factors, T0, drift velocities, PRFs, ...
- DAQ (Raphaelle):
 - Detector algorithms in CVS
 - Pad-by-pad status (dead channels, noise level, etc.)
using pedestal runs (w/o ZS): `TRDPEDESTALda.cxx`
 - Histogram filling + fit to extract baseline + σ → DAQ FXS (256kB)
 - Coarse V_{drift} calibration (no reconstruction)
using runs with ZS: `TRDVDRIFTda.cxx`
 - Fills TProfile2D with averaged pulse height → DAQ FXS (400kB)
- DCS (Wilfried):
 - Readout and analysis implemented in TRD preprocessor
 - Data compression via `AliSplineFit` or `TGraph`

Calibration cont'd

- SHUTTLE preprocessor procedures:
 - Pedestal run:
 - No DCS part
 - Take files from DAQ FXS and produce calibration objects
 - Physics run:
 - Run DCS part
 - Produce calibration objects from HLT
 - If HLT not successful, take V_{drift} from DAQ FXS
- Introduction of new calibration objects for pad-wise ADC noise
 - AliTRDCalROC (UShort per pad): 2.25 MB
 - AliTRDCalDet (Float per detector): 2.11 kB

Databases for PDC07

- Perfect calibration (default)
- Residual
 - 1% V_{drift} + gain
 - 0.02tb T0
- Fully decalibrated
 - 8% V_{drift}
 - 20% gain
 - 0.2tb T0

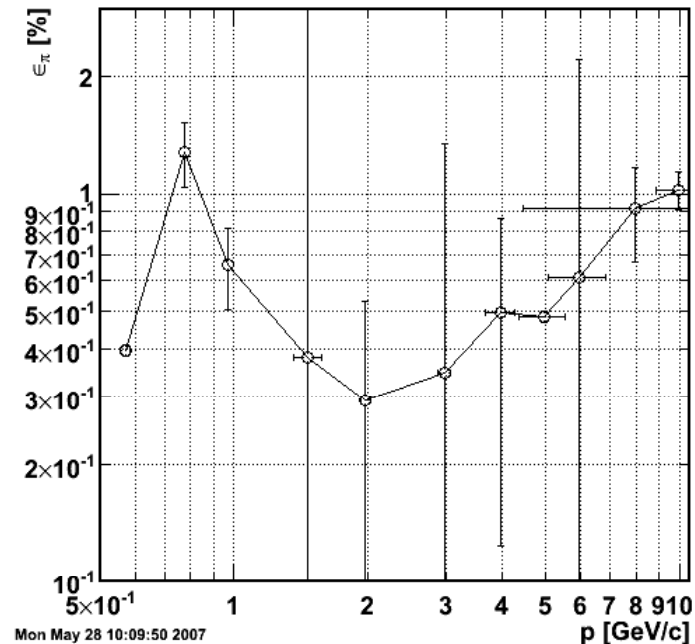


Calibration Summary by Alberto

- De-calibration tests
 - Local V_{drift} and T0:
 - Status **debug failed**
 - Should be ok. Affects X-position of cluster, not amplitudes
 - PRFwidth:
 - Status **failed** (no effects)
 - Not implemented in reconstruction, unclear if needed at all
 - Rest ok
- SHUTTLE preprocessor
 - DCS FXS (retrieval of PreTrigger information) **missing**
 - Example file with pretrigger information
 - To be passed to the SHUTTLE via FXS
 - Still needs to be provided!

Electron PID: 2-Dimensional Method

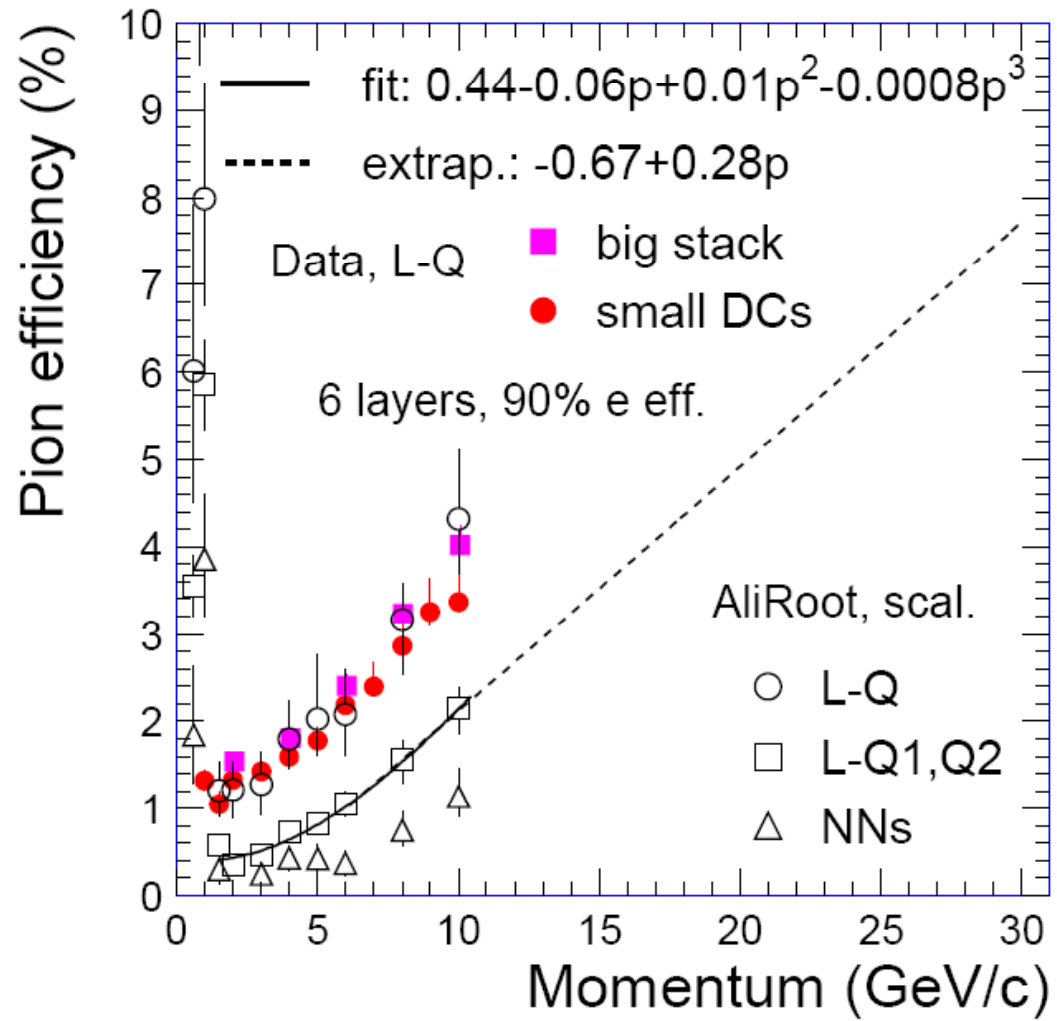
- 2-dim. method (Alexandru)
 - Deposited charge in two separate parts of the readout chambers
 - E.g. drift- vs amplification region
 - Details: Alexandru's talk at last offline week
 - Excellent performance
 - $\varepsilon_e < 5.0 \times 10^{-3}$ ($p = 2\text{GeV}/c$)
- Now default method
 - PID calculation done in `AliTRDtracker::RefitInward()`, not in `AliTRDreconstruction::FillESD()` any more
- Part of release 4-06



Electron PID: Neural Network

- Alternative approach (Alexander Wilk)
 - Exploits maximum available information
 - Uses ROOT neural network `TMultiLayerPerceptron`
- First implementation in AliRoot HEAD
 - Follows same scheme as 2-dim method
(`AliTRDtracker::RefitInward()`)
 - Introduction of additional reference histograms in OCDB
`TRD/Calib/PIDNN`

Electron PID



Project Planner

- Geometry:
 - Carbon plates and material outside acceptance (31/10/07)
- Raw data format:
 - Raw data with zero suppression (done)
- Reconstruction:
 - Check memory consumption of reconstruction (done)
 - Use tracklets in TRD (31/10/07)
- Quality assurance:
 - ESD QA (31/10/07)
 - Digit QA (31/10/07)
 - Pre-production validation (31/12/07)
 - Automatic run validation (31/10/07)

Local Rec.: Updates of Algorithms (Mateusz)

- Revision of `AliTRDRawStream::Next()`
 - 1.1s/event with 18 super modules
 - First update already in CVS
- New `AliTRDSignalStorage`
 - Faster data access than current `AliTRDdigitsArray`
 - Being tested right now
- Revision of cluster finder `AliTRDclusterizerV1`
 - Faster database access
 - Rearrangement of loops
 - Move to new `AliTRDSignalStorage`
 - `AliTRDrawData::Raw2Digits()` faster by factors 2-4!
 - Currently being tested and will go to CVS soon

Local Rec.: AliTRDSignalStorage (Mateusz)

- Container class for TRD signals
 - Faster replacement for `AliTRDdataArrayI / AliTRDdigitsManager`
 - Contains dynamically allocated signals array
 - Used for information from raw data stream (no dictionaries, have to be handled separately)
 - Used in cluster finder
 - Gain in speed by factors of 2-4
 - Easy to translate/copy data from/to `AliTRDdataArrayI/F`

Calibration: SHUTTLE (Raphaelle, Wilfried)

- TRD preprocessor with DCS, DAQ, and HLT analysis available
- DCS:
 - Stores TGraphs in the OCDB
- DAQ:
 - Stores FXS file content as reference data
 - If no HLT calib. present: Analyse TProfile2D for V_{drift}
 - Store calibration objects in OCDB
- HLT:
 - Stores histograms (V_{drift} , gain, PRF) from FXS file as reference data
 - Analyzes histograms and stored calibration objects in OCDB

DCS Parameters

DCS alias	N of channels	Data type
trd_chamberByteStatus[000..539]	540	char
trd_goofyHv	1	float
trd_goofyPeakPos00	1	float
trd_goofyPeakPos01	1	float
trd_goofyPeakArea[00..01]	2	float
trd_goofyTemp[00..01]	2	float
trd_goofyPressure	1	float
trd_goofyVelocity	1	float
trd_goofyGain[00..01]	2	float
trd_goofyCO2	1	float
trd_goofyN2	1	float
trd_gasO2	1	float
trd_gasOverpressure	1	float
trd_envTemp[000..539]	540	float
trd_hvAnodeImon[000..539]	540	float
trd_hvDriftImon[000..539]	540	float
trd_hvAnodeUmon[000..539]	540	float
trd_hvDriftUmon[000..539]	540	float
trd_adcClkPhase	1	float

Alignment (Dariusz)

- Alignable volumes: 18 super modules (SM) + 540 chambers
- SM will be aligned based on survey
 - Software to read and analyse survey data is ready
- Chamber will be aligned based on tracks with TPC as reference
 - Central barrel alignment procedure works reasonably well for TRD
- Expected initial and residual misalignment, as used for PDC:

$rd\phi$ (mm)	dz (mm)	dr (mm)	rot ϕ (mr)	rot z (mr)	rot r (mr)	
3.0	3.0	3.0	0.4	2.0	0.4	SM initial
1.0	1.0	1.0	1.0	1.0	0.7	Chamber initial
0.02	0.03	0.07	0.3	0.3	0.1	Chamber residual

- Chamber initial too optimistic by factor ~ 2 (first SM)
- Chamber residual does not include error from track extrapolation. Still needs to be simulated

Alignment: Next Steps (Dariusz)

- Determine the influence of misalignment on the reconstruction efficiency and the momentum resolution
- Determine the alignment precision as a function of the number of used tracks
- Use cosmic ray data to determine the chamber misalignment of the first installed SM